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Machine-breaking in England and France during the Age of Revolution

Jeff Horn

THE TRIUMPH OF THE MACHINE is part of the heroic story of industrialization currently told by many historians. In these accounts of the great transformation, the inherent logic of *laissez-faire* capitalism brushed aside all opposition. Yet, alongside these heroic accounts, an important set of literatures has arisen that understands the British state as liberal in ideology, but fundamentally interventionist in practice. These interpretations intertwine to portray the oft-times violent reaction of the working classes to the introduction of mechanized production, including, most notoriously, the Luddite movement of 1811-1817, as only a minor, temporary hurdle to be vaulted easily on the fast track to industrial society. David Landes summed up this vision of the period: "the workers, especially those bypassed by machine industry, said little but were undoubtedly of another mind."[1] Nor can it go without saying that such a cavalier attitude about the reactions of the working classes to

[1]The reference comes from David S. Landes, *The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present* (Cambridge, UK 1969), 123. For a similar reading of the historiography, see Maxine Berg, "Workers and Machinery in Eighteenth-century England," in John Rule, ed., *British Trade Unionism 1750-1850: The Formative Years* (London 1988), 52.

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mechanization is, in no way, limited to understandings of industrialization in Great Britain.

An epic version of industrialization overlooks the true nature of the barrier to both technology transfer and mechanization formed by the resistance of the labouring classes to the introduction of the machine.[2] This essay will attempt to depict the dramatic impact that the violent wrecking of machines had on entrepreneurial decision-making and state action in England and France. Resistance to the machine must be situated in its local, regional, national, and international contexts in order to understand the consequences of organized, violent machine-breaking on the course of industrial development. The movements that led to the widespread destruction of machines were organized regionally rather than locally and the patterns of entrepreneurial reaction, technological development, and technology transfer, as well as mechanization, also varied by region.

At the national level, historians pay far greater attention to machine-breaking in the English context, but it actually had much greater resonance in France, where its most important outbreak took place more than a generation earlier, in 1789. Because it was associated with the outbreak of the Revolution, organized violence directed against machines in France fostered an environment in which "the threat from below" powerfully discouraged entrepreneurs from introducing new technologies or promoting mechanized production. In England, the lack of a revolutionary threat enabled the English state to deploy a deeper and more effective repression in support of innovating entrepreneurs. As Karl Polanyi remarked long ago, "For as long as that system is not established, economic liberals must and will unhesitatingly call for the intervention of the state in order to establish it, and, once established in order to maintain it."[3] Thus, the incidence and repression of machine-breaking emerges as an important means of distinguishing the paths to industrialization followed by these rival nations and a potential means of understanding patterns of industrialization in other parts of the world.

II. *Luddism, Labour Militancy, and the State in England*

[2]An important recent article summarizes this view for Britain. Alessandro Nuvolari, "The 'Machine Breakers' and the Industrial Revolution," *The Journal of European Economic History*, 31, 2 (2002), 393-426.

[3]Here I am following the current literature to dispute an assertion by E.P. Thompson, see below. Karl Polanyi, *The Great Transformation* (New York 1944), 149.

[4]This assertion rests on the work of Eric J. Hobsbawm, "The Machine Breakers," (1952) in *Laboring Men: Studies in the History of Labour* (Garden City, NY 1964), 7-26, esp. 9-13; George Rudé, *The Crowd in History: A Study of Popular Disturbances in France and England 1730-1848* (New York 1964) and *Paris and London in the Eighteenth Century: Studies in Popular Protest* (New York 1970); and E.P. Thompson, *The Making of the English Working Class* (New York 1963), 452-602. For a recent survey of the literature on the subject, see John E. Archer, *Social Unrest and Popular Protest in England 1780-1840* (Cambridge, UK 2000), 44.

Labour militancy in 18th-century England was, by most historical accounts, more widespread, deeper, and violent than its French counterpart.[4] Labourers organized extensively, usually by trade and region; they participated in the development of what E.P. Thompson termed "a moral economy" in their collective dealings with entrepreneurs and the state.[5] This alternative political economy, rooted in custom, rested partly on established legal protections and on the power of local officials, notably the county justices of the peace, to set wages.[6] Violations of this moral economy entailed some sort of "innovation" in the manner of payment, mode of work, new divisions of labour, or the introduction of new technologies. When the state failed to turn the clock back, English labourers had recourse to various tactics, including the petition, various forms of intimidation, "combination," i.e. the expansion of unions of labourers, the strike, and machine-breaking. In many, perhaps even most cases, intimidation, protest, and direct action led to concessions in favour of custom imposed by state officials on innovating entrepreneurs in the name of the public good.[7]

Some areas and industries were particularly prone to resistance to mechanization. In his investigation of the West Country and Yorkshire woolen industries, Adrian Randall argues convincingly that it was the nature of the local community that determined how the machine would be received and what range of popular responses were possible. Maxine Berg adds suggestively that, in the 1730s and again in the 1770s, the displacement of female labour was a crucial source of anti-machinery sentiment, a situation that would also arise in the 1820s and 1830s in early industrial New England. John Rule asserts that resistance to machinery in provincial England was intimately linked to the issue of apprenticeship.

The Spitalfields silk weavers rioted against the introduction of machines in 1675, 1719, 1736, and the 1760s. In the course of the "Wilkes and Liberty" campaign, Charles Dingley's new mechanical saw mill was attacked and taken apart by a crowd of 500 sawyers in May 1768. James Hargreaves' first spinning jenny was dismantled in 1767; two years later more of his machines were destroyed. In 1776, the West Country experienced widespread popular sabotage of almost every form

[5]E.P. Thompson, "The Moral Economy of the English Crowd in the Eighteenth Century," *Past and Present*, 50 (1971), 76-136.

[6]This 1563 law was known as the statute of artificers, c. 5 Elizabeth. It stipulated the length of the workday and gave the justices, country sheriffs, and mayors the power to fix wages annually at the Easter quarter sessions. James Moher, "From Suppression to Containment: Roots of Trade Union Law to 1825," in Rule, ed., *British Trade Unionism*, 77.

[7]Adrian Randall, "The Industrial Moral Economy of the Gloucestershire Weavers in the Eighteenth Century," in Rule, ed., *British Trade Unionism*, 29-51; Maxine Berg, *The Age of Manufactures 1700-1820: Industry, Innovation and Work in Britain*, 2nd ed. (London 1994), 185-6; M.J. Daunton, *Progress and Poverty: An Economic and Social History of Britain 1700-1850* (Oxford 1995), 486-95; John Rule, "Trade Unions, The Government and the French Revolution, 1789-1802," in John Rule and Robert Malcolmson, eds., *Protest and Survival: the Historical Experience — Essays for E.P. Thompson* (London 1993), 112-38.

of machinery associated with the woolen industry. Three years later, a mob around Blackburn demolished every carding engine and all the jennies that used more than 24 spindles, as well as other machines utilizing water or horse power. The same year, the water frames at Richard Arkwright's works at Chorley were destroyed simultaneously with several recently-established cotton mills. Machine-breaking outbreaks in Lancashire and the Midlands flared up from 1778 to 1780. In the West Country, the introduction of the flying shuttle sparked riots at Trowbridge in 1785, 1792, and several times between 1810 and 1813. Joseph Brookhouse's attempt to utilize Arkwright's techniques to mechanize the spinning of worsted yarn provoked a violent response in Leicester. In 1792, Manchester witnessed an attack on a factory containing 24 of Edmund Cartwright's power looms; ultimately, the factory was burned by outraged handloom weavers. A major campaign against the introduction of the gig mill and shearing frame took place in the West Country woolen industry from 1799-1802.[8] Recent accounts emphasize that these events were an element of a wide-ranging industrial protest rather than simplistic knee-jerk reactions to short-term threats associated with industrialization and economic modernization. The labouring classes were not necessarily opposed to all innovation, rather they wrecked machines in order to maintain control over the labour process and resist the imposition of the factory system. In technological terms, machine-breaking was also a means of influencing which mechanical approach to a technical problem would prevail.[9]

Although machine-breaking had been a considerable, customary form of industrial relations in Britain for a century, it assumed a darker and more tragic place in the folklore of industrialization with the Luddites. Named after a supposed Leicester stockinger's apprentice named Ned Ludham who responded to his master's reprimand by taking a hammer to a stocking frame[10], the followers of "Ned Ludd," targeted this machine for destruction. The movement began in February 1811 in the Midlands in the triangle formed by Nottingham, Leicester, and Derby in the lace and hosiery trades. Protected by exceptional public support within their communities, Luddite bands conducted at least 100 separate attacks that destroyed

[8]These two paragraphs are based on Archer, *Social Unrest and Popular Protest*, 45; Berg, *The Age of Manufactures*, 254, and "Workers and Machinery," 62-3, 67; Ian R. Christie, *Wars and Revolutions: Britain, 1760-1815* (Cambridge, MA 1982), 173; Hobsbawm, "The Machine Breakers," 14, 16; Nuvolari, "The 'Machine Breakers' and the Industrial Revolution," 395-401; Gary Kulik, "Pawtucket Village and the Strike of 1824: The Origins of Class Conflict in Rhode Island," *Radical History Review*, 17 (Spring 1978), 4-37; Adrian Randall, *Before the Luddites: Custom, Community and Machinery in the English Woollen Industry, 1776-1809* (Cambridge, UK 1991), 149-86; Rudé, *Paris and London in the Eighteenth Century*, 249-50 and *The Crowd in History*, 71; John Rule, *The Labouring Classes in Early Industrial England, 1750-1850* (London 1986), 278; Malcolm I. Thomis, *The Luddites: Machine-Breaking in Regency England* (Hamden, CT 1970), 16.

[9]Nuvolari, "The 'Machine Breakers' and the Industrial Revolution," 407-26.

[10]Rudé, *The Crowd in History*, 79.

about 1,000 frames (out of 25,000!) valued at £6,000-10,000. As Luddism in the Midlands died down in February 1812, inspired woolen workers in Yorkshire acted in January. A third outbreak took place in April among the cotton weavers of Lancashire. Factories were attacked in both places by armed crowds, and thousands participated in these activities, including many whose livelihoods were not threatened directly by mechanization. Despite the heterogeneous and cross-sectoral composition of the "crowds" involved, the Luddites generally distinguished between those machines that they regarded as innovations or that threatened employment, and left other machines alone.[11] The specific causes of these three outbreaks varied, not only according to region, but also by sector; collectively, these initial episodes of Luddism caused perhaps £100,000 of damage. Further waves of machine-breaking in which a few hundred additional stocking frames were destroyed took place in the winter of 1812-13, the summer and fall of 1814, and the summer and fall of 1816 that sputtered into early 1817.[12]

Nor did machine-breaking disappear with the Luddites. Recent commentators, most notably Joel Mokyr, have portrayed these events as last-ditch efforts with little chance of success.[13] Machine-breaking accompanied extensive rural rioting in East Anglia in 1816, with a particularly destructive flare-up in 1822. The targets here were the mole plough and the threshing machine. In 1826, Lancashire witnessed an even more extensive wave of machine-breaking than in 1811-12 with 21 factories assaulted and 1,000 looms smashed, which were valued at £30,000.[14] Three years later, power looms were the target of Manchester's working classes. The repeated recourse to machine-breaking culminated with the Captain Swing Riots. Named after the swinging stick of the flail used in threshing,[15] "Captain Swing" first acted in 1829 and continued into 1832 with a high point in late August 1830. Arson was the primary weapon used by agricultural labourers, but machine-breaking was an important tactic in the expression of popular anger. Although blackened with the term "riots," the Captain Swing movement can best be characterized as a series of mass demonstrations among the poor and labouring

[11]Nuvolari suggests that workers were articulating a sophisticated conception of technical change closely related to the concept of "appropriate technology" most fully revealed in studies of development. This early example of the phenomenon illustrates why machine-breaking during the Industrial Revolution still has resonance. Nuvolari, "The 'Machine Breakers' and the Industrial Revolution," 395.

[12]Francis O. Darvall, *Popular Disturbances and Public Order in Regency England* (London 1934), 259-60, 209-10; "The Luddites in the Period 1779-1830," in Lionel M. Munby, ed., *The Luddites and Other Essays* (London 1971), 39; and Rudé, *The Crowd in History*, 80, 89, and 92.

[13]For a review of Mokyr's widely separated statements on early 19th-century machine-breaking and its shortcomings, see Nuvolari, "The 'Machine Breakers' and the Industrial Revolution," 393-4, 402-7.

[14] Darvall, "The Luddites," 47.

[15]Rudé, *The Crowd in History*, 150.

classes that broke out across a broad swath of southern England and into the Midlands. The goals of the demonstrators varied by region and were quite localized. As a result of more than 1,500 separate incidents, an impressive proportion of England's threshing machines were destroyed. A fair tally of industrial machinery was also wrecked as a consequence of Captain Swing.[16] In a separate event, the attack on Beck's steam factory at Coventry in 1831 seems to have been the final episode of industrial Luddism in Britain. From this point, the popular classes of Britain seem to have shifted tactics away from machine-breaking as a major means of resolving industrial or work-related disputes.[17]

If the longevity, geographical scope, and popular support for machine-breaking activities in Great Britain was impressive, the one-sided magnitude of government repression of such movements must astonish even those who recognize the interventionist reality of early liberal administration.[18] The Duke of Wellington began the Peninsular Campaign in 1808 with less than 10,000 troops, but the English state deployed 12,000 troops to eradicate Luddism in 1812. On 14 February 1812, Parliament passed a bill making frame-breaking a capital crime. George Rudé provided an important first approximation of the virulence of the response of the English state and courts to popular riots and disturbances including, but not restricted to, the events referred to above. Against a grand total of two fatal victims of the Luddites and the Captain Swing movement combined, British courts hanged more than thirty Luddites in 1812-13, and nine of the nineteen executed in 1830, "Swung" for the crime of machine-breaking. These figures do not include the casualties involved in the attacks themselves. In repulsing the Luddite attack on Daniel Burton's steam-loom factory at Middleton in Lancashire on 18 April 1812, five were killed and eighteen wounded before a crowd of colliers returned to finish the job. In addition to the dead and maimed, dozens more Luddites and 200-plus machinebreakers involved in Swing were sent to Australia. Nearly 650 were imprisoned.[19] More generally, Rudé found that in the course of more than 20 major riots and demonstrations between 1736 and 1848, the English "crowd" killed no more than a dozen while the courts hanged 118, and 630 were killed by the military. These figures include the "Wilkes and Liberty" movement, the Gordon Riots of 1780, and Peterloo in 1819.[20]

[16]See Archer, *Social Unrest and Popular Protest*, 15-21, 54-5.

[17]Daunton, *Progress and Poverty*, 499-501.

[18]The disparity of the numbers involved here, their relationship to narrative, and governmental practice provide an interesting test case of early liberal ideology in practice. On the significance of statistics in late 18th-century liberal thinking, see Mary Poovey, *A History of the Modern Fact: Problems of Knowledge in the Sciences of Wealth and Society* (Chicago 1998), esp. 239-45.

[19]These figures come from Rudé, *The Crowd in History*, 85-90, 255.

[20]Archer, *Social Unrest and Popular Protest*, 9, 87; Rudé, *Paris and London*, 28 and *The Crowd in History*, 83-4.

Rudé's argument is that machine-breaking was only the most spectacular aspect of the popular restiveness of the early industrial period. Just as machine-breaking was an important customary form of dealing with industrial disputes and, as Thompson argues, a key stage in the development of the possibility of revolution among the English working classes, so too, other elements of British state repression were applied to machine-breaking. To mention only those measures directly pertaining to the work environment of the industrial labouring classes, state repression included: Pitt's Two Acts restricting individual liberties in1795; the suspension of the Act of Habeas Corpus; the Administering Unlawful Oaths Act in 1797; the Combination Acts of 1799-1800; the abrogation of the remaining elements of paternalist industrial legislation in woolens in 1809; and the repeal of the Elizabethan apprenticeship statutes in 1814, when the power of officials to regulate wages was also eliminated.[21] To such legislative action could be added the enrollment of property-owners in a "patriotic" militia used to confront direct action by the popular classes. The government also employed an army of spies to blanket the most restive districts. This era also witnessed extensive redeployment of the regular armed forces: 155 military barracks were constructed in industrial districts between 1792 and 1815. Thompson summed up the effects of these repressive measures: "England, in 1792, had been governed by consent and deference, supplemented by the gallows and the 'Church-and-King' mob. In 1816 the English people were held down by force."[22]

Such an argument, with its resonant echoes of the emergence of first a revolutionary and then a military dictatorship in France, was muted only slightly in crossing the Channel. It raises the question of whether a revolution could have broken out in England during this period. Thompson clearly believes that it was possible. In fact, he expressed amazement at the English government's skill at forestalling conspiracy, insurrection, and revolution during the period from 1792 to 1820.[23] In the intervening 30 years, an impressive literature has assessed the possibility of revolution from a variety of perspectives. A historiographical consensus now appears

[21]A stimulating legal history of these issues is John V. Orth, *Combination and Conspiracy: A Legal History of Trade Unionism, 1721-1906* (Oxford 1991). See also Moher, "From Suppression to Containment." However, all English studies of the use of criminal law as a means of disciplining the working classes follow in the footsteps of Douglas Hay, "Property, Authority and the Criminal Law," in Douglas Hay, ed., *Albion's Fatal Tree: Crime and Society in Eighteenth-Century England* (London 1975).

[22]Thompson, *The Making of the English Working Class*, 451, 474, 529, 544-5, 605. The quotation is from the final page. See also Randall, *Before the Luddites*, 248.

[23]Thompson, *The Making of the English Working Class*, 493.

[24]For just a few examples, see Christie, *Wars and Revolution*; H.T. Dickinson, *Liberty and Property: Political Ideology in Eighteenth Century Britain* (London 1977); J.C.D. Clark, *English Society 1688-1832: Ideology, Social Structure and Political Practice during the Ancien Regime* (Cambridge, UK 1985); François Crouzet, "Great Britain's response to the French Revolution and to Napoleon," in *Britain Ascendant: Comparative Studies in*

to exist, however, that Britain was too well-governed and too subject to repression for revolution to have broken out, especially once war with the Napoleonic regime resumed in 1803.[24] Thus, the era of industrial unrest in Great Britain of such great interest to historians of labour, the crowd, and industrialization, has *not* been associated with a genuine threat of revolution despite government rhetoric to the contrary.[25]

Why is that consensus significant? The key here, both for Europe and for other places in other times, is the effective action of the state — in conciliation, mobilization of nationalism, and repression — which even Thompson and Rudé acknowledge as having vigorously prevented the emergence of a revolutionary moment until 1831-2.[26] Such activity hardly conforms to standard accounts of the *laissez-faire* nature of the British state after the publication of *The Wealth of Nations*. Thompson and Randall, among others, assert that the revolutionary era (1792-1815) and outbreak of Luddism (1811-17) marked a transition from intermittent paternalist protection of the labouring classes to the imposition of a *laissez-faire* political economy upon and against the will of the working classes.

Rule's argument and the provocative new interpretation of Leonard Rosenband provide another way of understanding the general tenor of government action during this period. They believe that the primary purpose of the Combination Acts was not simply to destroy unions or to prevent the spread of political radicalism as is often claimed; rather, they convincingly depict the difficulties encountered by employers determined to replace customary practice and its control over knowledge with their own discipline (or perhaps, discipline from above) as the central concern behind these infamous measures.[27] In fact, according to Randall, in the af-

Franco-British Economic History, trans. Martin Thom (Cambridge, UK and Paris 1990 [1985]), 262-94; Jennifer Mori, *Britain in the Age of the French Revolution 1785-1820* (London 2000), 92-103, 133-152; John Stevenson, *Popular Disturbances in England 1700-1832*, 2nd edition (London 1992), 326-30; and Archer, *Social Unrest and Popular Protest*, 89-93. For contrary views, see Edward Royle, *Revolutionary Britainnia? Reflections on the Threat of Revolution in Britain 1789-1848* (Manchester 2000); and the more venerable Roger Wells, "English society and revolutionary politics in the 1790s: the case for insurrection," in Mark Philp, ed., *The French Revolution and British Popular Politics* (Cambridge, UK 1991), 188-226 and *Insurrection: the British Experience, 1795-1803* (Gloucester 1983).

[25]The only exception I have found is that of the outdated 1934 monograph of Darvall, *Popular Disturbances and Public Order in Regency England*.

[26]Thompson, *The Making of the English Working Class*, 807-8; and Rudé, *The Crowd in History*, 252-64.

[27]Rule, "Trade Unions, the Government and the French Revolution, 1789-1802," 112-38, esp. 118-22; and Leonard Rosenband, "Comparing Combination Acts: French and English Papermaking in the Age of Revolution," *Journal of Social History*, 29, 2 (May 2004), 165-85.

termath of Luddism, the English state increasingly identified its interests with those of the large-scale "innovating" manufacturers which led to a more systematic implementation of *laissez-faire* ideas at the expense of customary protections.[28] Furthermore, this policy flourished despite the existence of considerable support among a segment of the élite and many small producers in favor of retaining such protections.[29] Machine-breaking and its repression highlights once again the disparity between *laissez-faire* ideas and government action in early Industrial Britain while emphasizing the need for a reconsideration of the role of the state in the link between industrial protest and technological change, particularly after the end of continental war in 1815.[30]

The argument that machine-breaking, among a host of popular actions, evoked a disproportional *state* response frames any evaluation of the effects of machine-breaking in England. In the best of situations, understanding the timing of the adoption of machines is tenuous, but, in the wake of extensive machine-breaking, the task becomes even more uncertain. Landes and Mokyr head the influential list of those who dismiss the possibility that any brakes on the process of mechanization could stem from the direct action of the labouring classes.[31] However, this dismissal is undermined by the consensus of historians that English machine-breaking had a substantial impact on mechanization.

The historiographical consensus essentially contends that machine-breaking had some limited, albeit temporary, successes in Great Britain. The woolen industry in the West Country was most successful in resisting mechanization through direct action. After the Wiltshire Outages of 1799-1802, the gig frame did not return until after 1815. A 1787 attack on machinery in Leicester appears to have discouraged the introduction of mechanized spinning for a generation. The other major triumph of the machine-breakers was registered by the agricultural labourers who destroyed thousands of threshing machines during the Captain Swing outbreak; these machines did not return in anything like the same numbers to most of southern England for at least a generation. Short-lived successes included higher wages and the stoppage of the practice of making "cut-ups" in the Nottingham hosiery industry, and the interdiction of shearing frames in Yorkshire in 1812, as well as a wage

[28]In the emergence of the British financial system, Mary Poovey suggests that the parts of the system developed unevenly, meaning that "it would be misleading to personify the system as a whole or to speak of an implicit logic that governed it." This useful corrective, however, should not be taken to mean that collective action did not take place on the part of the employers or the employed. See introduction to her edited volume, *The Financial System in Nineteenth-Century Britain* (New York 2003), 3.

[29]Randall, *Before the Luddites*, 248 and "The Philosophy of Luddism: The Case of the West of England Woolen Workers, ca. 1790-1809," *Technology and Culture*, 27 (1986), 15.

[30]The late Sidney Pollard provided some clues as to how such a reassessment might be conceptualized. "Management and Labor in Britain During the Period of Industrialization," reprinted in *Labour History and the Labour Movement in Britain* (Aldershot 1999). See also Nuvolari, "The 'Machine Breakers' and the Industrial Revolution," 407-26.

increase after Swing in 1830. Thus, beyond the confines of the city of Leicester, from the standpoint of industrial technology, the only relatively unequivocal success by English machine-breakers seems to have occurred in the West Country, an area rapidly becoming marginalized by the West Riding in an industry steadily displaced by cotton.[32]

A question must then be asked: what was the relationship between the energetic, even excessive, response of the English state to machine-breaking, and the somewhat minimal reaction to militancy by the labouring classes on the part of innovating entrepreneurs interested in mechanization? I would like to hazard a provisional interpretation of this crucial problem of *mentalité*, this time of British entrepreneurs. A definitive answer will require much more detailed comparative research.

Despite the well-documented militancy, widespread organization, and politicization of the English labouring classes, the British peoples — unlike their French counterparts — were generally willing to follow the lead of the élites. The relative lack of violence surrounding British political action and the predilection for attacks on property rather than persons in industrial protest are signs of this willingness. As a result, determined British entrepreneurs were able to overcome customary industrial and craft practices which, in most regions, were antithetical to mechanization and/or the imposition of the factory system. British entrepreneurs took advantage of these conditions to impose a measure of industrial discipline that the labouring classes had resisted successfully in the 18th century. This achievement bore astonishing fruit after 1830, when the economic benefits of mechanization had spread to enough trades that entrepreneurs increasingly were willing to follow in the footsteps of the pioneers. Not coincidentally, it was at this time that recent accounts situate the rapid acceleration of economic growth associated with industrial "takeoff."[33]

What cannot be emphasized strongly enough is that the reason why British entrepreneurs were able to embark on and ultimately complete this generation-long

[31]Joel Mokyr, *The Lever of Riches: Technological Creativity and Economic Progress* (Oxford 1990), 255; and Landes, *The Unbound Prometheus*, 123.

[32]Christie, *Wars and Revolutions*, 173; Hobsbawm, "The Machine Breakers," 21; Randall, *Before the Luddites*, 289; and Rudé, *The Crowd in History*, 90. Nuvolari cites the 1792 destruction of the Grimshaw factory in Manchester as the "main determinant of the delayed adoption of this technique in the weaving industry." He is much more optimistic about the effects of such actions. "The 'Machine Breakers' and the Industrial Revolution," 397, 417.

[33]This paragraph is based on Archer, *Social Unrest and Popular Protest*, 75-8; Stanley D. Chapman, *The Early Factory Masters: The Transition to the Factory System in the Midlands Textile Industry* (Devon 1967), 174-209; Hobsbawm, "The Machine Breakers," 17-8; Pollard, "Management and Labor in Britain During the Period of Industrialization," 1-19 and *The Genesis of Modern Management: A Study of the Industrial Revolution in Great Britain* (Baltimore, MD 1965), 185-242; Randall, *Before the Luddites*; Rudé, *Paris and London*, 27-8; Rule, *The Experience of Labour*, 131-44, and *The Labouring Classes*, 269-78. On the

project was the absence of a genuine revolutionary threat to their position. This situation can be attributed to the existence of more effective administration, or the existence of political outlets, or the greater willingness of the English élite to accommodate power-sharing; the cause of British stability is not the key issue here. The fact that industrial protest in Britain tended to occur during the upswing of a boom also points to the ability of entrepreneurs to minimize the possibility of revolution. Innovative manufacturers in Great Britain could rely on the state to endorse their interests and assist them in this task of "breaking" the British working classes.[34] In the main, this faith in the state was justified; more than 60 acts were enacted during the crucial 1793-1820 period to prohibit working-class collective action. Although such frequent intervention also illustrates the doggedness of resistance, again, it is surely not a coincidence that political reform came in the 1830s — only *after* a generation raised under the new discipline was at work.[35]

The evidence for this interpretation is best taken from the action of British entrepreneurs. If the actions of the "heroic" British industrialist are well-known, the ability of British entrepreneurs to overcome determined labour resistance with the support of a powerfully repressive state apparatus must be seen in comparative terms as a unique situation for the early industrial era, but how it fits the experience of other places and times deserves further research. In the continental context, James Hargreaves' actions were incomprehensible. After his first spinning jenny was destroyed by a mob in 1767 and a crowd forcibly dismantled others in 1769, he moved to Nottinghamshire to set up a new establishment. As seen above, this area had a well-deserved reputation for industrial protest and destructive attacks on machinery. In the next section, the difference between this behavior and that of French entrepreneurs will be demonstrated. The ideology of *laissez-faire* allowed this internal transfer to take place, but in this domain, as in so many others, the activities of

final point, see N.F.R. Crafts, *British Economic Growth during the Industrial Revolution* (Oxford 1985).

[34]This situation provides a prehistory for the recent renewed emphasis on the question of poverty, first during the 1790s, and then a generation later during the Victorian era. Poverty is at the heart of many interpretations of the British state and its power influenced heavily by post-modernism. See, for example, Mitchell Dean, *The Constitution of Poverty: Toward a Genealogy of Liberal Governance* (London 1991); Peter Mandler, ed., *The Uses of Charity: the Poor on Relief in the Nineteenth-Century Metropolis* (Philadelphia 1990); and several articles in Andrew Barry, Thomas Osborne, and Nikolas Rose, eds., *Foucault and Political Reason: Liberalism, Neo-liberalism and Rationalities of Government* (London 1996).

[35] Archer, *Social Unrest and Popular Protest*, 86; C. R. Dobson, *Masters and Journeymen: A Pre-history of Industrial Relations 1717-1800* (London 1980), appendix; Moher, "From Suppression to Containment," 74, 87-8, 90; and Rudé, *The Crowd in History*, 218.

[36]Berg, "Workers and Machinery," 62; Hobsbawm, "The Machine Breakers," 18-9; and Moher, "From Suppression to Containment," 83. Richard Biernacki emphasizes the difference between the ideology of liberalism and the lived reality for the workers. *The Fabrica-*

the British state during the early industrial era bore little resemblance to the distant, limited role for government advanced by contemporary proponents of Smithian economics.[36]

III. *Machine-breaking and "the threat from below" in France*

In England, machine-breaking has been revealed as a consistent and persistent element of industrial work relations from the late 17th century well into the 19th century. Yet, in France, machine-breaking did not have the same deep roots as in England. If the silk weavers of Spitalfields were among the most dogged groups of British workers in resisting mechanization, labour relations in Lyon's *grande fabrique* seem to suggest that this issue was less important than the relative positions of merchants, masters and men, the role of municipal oversight, the imposition of work rules affecting employment, and opportunities for female employment.[37] In general, in 18th-century France, there was significantly less recourse to machine-breaking or any other form of violence against persons or property.[38]

Yet across a variety of trades in diverse regions, this situation began to change on the eve of the French Revolution. Perhaps the most notable outbreak of resistance to the machine before 1789 took place in Saint-Étienne, southwest of Lyon. Beginning in 1785, labour agitation in the region exploded; the issue was the defence of customary practice when faced with innovations involving mechanization, the division of labour, and manufacturing techniques brought from abroad. Motivated partly by a kind of xenophobia of industrial custom, the agitation began in the metallurgical trades when two workers from Liège brought new methods to forge musket barrels using trip hammers that would eliminate one step — and thus one job — from local production routine, while simultaneously increasing the productivity of others. The metal workers responded by driving the Belgians from the city. The municipality supported the workers and explicitly defended local manufacturing custom. Between 1785 and the spring of 1789, metal workers, silk ribbon-mak-

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tion of Labor: Germany and Britain, 1640-1914 (Berkeley, CA 1995), 255-8. In a postmodern vein, Mitchell Dean argues for liberalism as a governing ethos of society rather than a type or form of state structure in *Governmentality: Power and Rule in Modern Society* (London 1999), 49-55.

[37]Daryl M. Hafter, "Women Who Wove in the Eighteenth-Century Silk Industry of Lyon," in Daryl M. Hafter, ed., *European Women and Preindustrial Craft* (Bloomington, IN 1995), 50-5.

[38]Dobson, *Masters and Journeymen*, appendix; Hobsbawm, "The Machine Breakers," 11-4; Steven L. Kaplan, "Réflexions sur la police du monde du travail, 1700-1815," *Revue historique*, 251 (December 1979), 35, 69-70; Frank E. Manuel, "The Luddite Movement in France," *Journal of Modern History*, 10 (June 1938), 180-3; Allan Potofsky, "The Builders of Modern Paris: The Organization of Labor from Turgot to Napoleon," PhD thesis, Columbia University, 1993; Rudé, *The Crowd in History*, 125 and *Paris and London*, 69; Michael

ers, and coal miners intervened publicly on at least seven occasions to prevent the introduction of advanced machinery and to cast out Swiss, Belgian, and German workers who had brought new industrial techniques. While the *ancien régime* lasted, the violent tactics of the workers of Saint-Étienne enjoyed substantial if temporary success in conserving their customs.[39]

A harbinger of the coming storm blew in from lower Normandy where the cotton spinners of Falaise responded to their dismissal by wrecking their own machines on 11 November 1788. The situation in Normandy remained uncertain throughout the spring of 1789. Widespread politicization resulting from meeting in assemblies and drawing up *cahiers de doléances* [lists of grievances] kept the kettle at full boil. The labouring classes voiced their grievances concerning encroaching mechanization in both rural and urban *cahiers*; moreover, their ire animated a wide variety of occupational groupings. In some areas, economic élites shared popular misgivings about mechanization, particularly as English-style machines were constructed and diffused at record rates amidst high rates of unemployment.[40]

Such reactions seem to culminate in the Réveillon Riots which took place in Paris' Faubourg Saint-Antoine on 27-28 April 1789. A crowd sacked Réveillon's workshops in an uprising related more to anxiety about food prices and access to labour and commodity markets than concerns about his introduction of new machinery. The military crackdown left up to 900 dead.[41] Yet the attack on machines found in the *cahiers* and their evident culmination in the Réveillon Riots should not over-

Sonenscher, "Journeymen, the Courts and the French Trades 1781-1791," *Past and Present*, 114 (1987), 77, 81.

[39]Ken Alder, *Engineering the Revolution: Arms and Enlightenment in France, 1763-1815* (Princeton, NJ 1997), 215; Jean-Baptiste Galley, *L'Élection de Saint-Étienne à la fin de l'ancien régime* (Saint-Étienne 1903), 58, 71; *Procès-verbal des officiers municipaux de la ville de Saint-Étienne*, 12 January 1790, Archives Municipales de [hereafter AM] Saint-Étienne 2F 16; Gérard Thermeau, *A l'aube de la Révolution industrielle: Saint-Étienne et son agglomération* (Saint-Étienne 2002), 267-8.

[40]Georges Lefebvre, *The Great Fear of 1789: Rural Panic in Revolutionary France*, trans. Joan White (New York 1973 [1932]), 48; Charles Ballot, *L'Introduction du machinisme dans l'industrie française* (Geneva 1978 [1923]), 20; Jules Joseph Vernier, *Cahiers de doléances des bailliages de Troyes et de Bar-sur-Seine*, 3 vols. (Troyes 1909-11), I: 192-93; Guy Lemarchand and Claude Mazauric, "Le concept de la liberté d'entreprise dans une région de haut développement économique : la Haute-Normandie 1787-1800," in Gérard Gayot and Jean-Pierre Hirsch, eds., *La Révolution française et le développement du capitalisme* (Lille 1989), 142-5. See also Roger Picard, *Les cahiers de 1789 et les classes ouvrières* (Paris 1910); and William Reddy, *The Rise of Market Culture: The Textile Trade & French Society, 1750-1900* (Cambridge, UK, and Paris 1984), 58.

[41]On this controversial event, see the important revisionist article of Leonard N. Rosenband, "Jean-Baptiste Réveillon: A Man on the Make in Old Regime France," *French Historical Studies*, 20 (1997), 481-510.

shadow the fact that due to the initiative of determined entrepreneurs and with the wholehearted support of state policy, mechanization in France accelerated on the eve of the Revolution.[42]

The emergence of a revolutionary situation in France in 1789 requires only the sketchiest of outlines. In scale, the turmoil that culminated with the fall of the Bastille in Paris on 14 July was dwarfed by the Great Fear. French uneasiness when faced with "brigands" — often desperate people on the tramp looking for food — combined with deep concern about the possibility of an aristocratic reaction led rural throngs to sack noble châteaux, sometimes firing the property but always destroying the debt records. This movement had a direct link to the renunciation of privileges on the frenzied night of 4-5 August and the promulgation of the *Declaration of the Rights of Man and Citizen.* In the provinces, municipal revolutions and the formation of "national guards" to protect property and the propertied stemmed from anxiety about what the increasingly active popular classes might do. The march on Versailles on 5-6 October that "captured" the royal family suggested that these concerns were warranted. A new political environment resulted from these events thereby laying the foundation for modern democracy while spawning a virulent conservative response.[43]

This litany of the activities of the popular classes that, taken together, transformed how France would be governed later, came to be termed by its critics: the "threat from below." If the outline of popular activities in 1789 is well-known, one element, namely machine-breaking, is mentioned only in passing, if at all. However, the incidence and effect of French machine-breaking, both on entrepreneurs and the state, demands more attention, particularly in light of the parallel with English developments for understanding their divergent paths of industrialization and the potential importance of machine-breaking as a wedge for understanding the economic ramifications of revolutionary situations more generally.

Machine-breaking in 1789 unfolded as part of the revolutionary moment. Appropriately enough, the first and largest incidence of machine-breaking took place in Normandy, the heartland of French attempts to industrialize on the English model.[44] In Rouen, three days of food rioting on 11-13 July required the intervention of not only the city's bourgeois militia, but also the local garrison. As Parisian crowds stormed the Bastille, infuriated woolen workers from the nearby textile town of Darnetal estimated at 200-300 broke through the picket of royal troops guarding the bridges over the Seine. Arriving in the manufacturing faubourg of Saint-Sever, these hand workers circulated among the dense complex of work-

[42]On this point, see "Foreign Policy as Industrial Policy: the Anglo-French Commercial Treaty of 1786," in Jeff Horn, *The Path Not Taken: French Industrial Policy in the Age of Revolution 1750-1830* (forthcoming).

[43]The literature on 1789 is vast. The best place to dive into the literature is William Doyle, *The Origins of the French Revolution*, 3rd ed. (New York 1999).

shops and proto-factories where they destroyed or burned English and English-style textile machines wherever they found them. Debourges and Calonne & Company, which made cotton velours, was invaded by 300-400 who had to break down the heavy wooden front door with paving stones to get at the machines. Thirty were demolished and the cording section of the enterprise sacked before the firm's own workers repelled the mob using weapons distributed by the owners. At another establishment just a few feet away, led by the manager, the workers fired on the crowd, sheltering their stock of English machines from the flames. Despite such spirited defence of new machinery, hundreds of spinning jennies and a number of recently-constructed carding machines were wrecked. Five rioters were killed when the city's militia confronted the crowds. In Rouen proper, another crowd ravaged the homes of several officials and the chief tax-collecting office before destroying machines in a wide swath of territory stretching from Darnetal to Bondeville, that included the French version of Arkwright's water-frame built by Nicholas Barneville.[45]

New incidents soon occurred. On 19-20 July, machines were broken in Saint-Sever, Oissel, and especially in Rouen, where English machines purchased by the city's Bureau of Encouragement were broken into pieces and then burned. As the Great Fear cast its long shadow across the country, government offices, particularly those of tax collectors, were overrun by a mob of 4,000 on the night of 3-4 August. Afterwards, the crowd invaded a factory where they seized a newly-built English-model carding machine and set it aflame urged on by a cheering crowd.[46] More machines were destroyed in Darnetal and Saint-Pierre de Franqueville in similarly symbolic fashion.[47] A water-frame operated by a small-scale spinner in Rouen was dismantled and his shop looted on 19 September. In mid-October, the turmoil erupted again. Martial law, a measure just introduced to give municipalities a means of re-establishing public order, was declared in Rouen after another series of

[44]My account begins with Jean-Pierre Allinne, "À propos des bris de machines textiles à Rouen pendant l'été 1789: émeutes anciennes ou émeutes nouvelles?" *Annales de Normandie*, 31 (March 1981), 37-58. Unless otherwise noted, I will rely on his account for events in Normandy.

[45]Michael Mollat, ed., *Histoire de Rouen* (Paris 1979), 286. On the composition of the crowds, see Allinne, "À propos," 46-8.

[46]Jean-Baptiste Horcholle, *Événements de la Révolution française à Rouen de 1789 à 1801*, n.d. [1801], Bibliothèque Municipale de [hereafter BM] Rouen Y 128*; and A.C. Poullain, *Analyses des délibérations de l'assemblée municipale et électorale du 16 Juillet au 4 Mars 1790 et du Conseil général de la Commune du 4 Mars 1790 au 25 Brumaire an IV (16 Novembre 1795)* (Rouen 1905), 5.

[47]Reddy, *The Rise of Market Culture*, 60.

[48]*Journal de Normandie* 87 (31 October, 1789), 397; Jacques Delécluse, *Les Consuls de Rouen, Marchands d'hier, entrepreneurs d'aujourd'hui: Histoire de la Chambre de Commerce et d'Industrie de Rouen des origines à nos jours* (Rouen, 1985), 85; *Jugement souverain prévôtal et en dernier ressort, qui condamne Jean-Louis Duchesne, Toilier, de profession, demeurant en la Paroisse de Sotteville à être pendu et en cinquante livres*

riots began on 17 October, both in Rouen and Sotteville. These final outbreaks were led by artisans: hundreds more spinning jennies were taken apart and the pieces consigned to the flames.[48]

In other parts of Normandy, machine-breaking took place in Louviers, where small-scale masters and men united to denounce and then destroy the machinery of innovating large-scale entrepreneurs. Distinct machine-breaking outbreaks also occurred in Argentan and in several places along the Channel in the *pays de caux*.[49] The same movement extended beyond the provincial borders, spilling northward into Picardy. Machines were destroyed widely in and around the woolens centre of Abbeville where stiff English competition after 1786 had agitated a formerly docile, rurally-based manufacturing labour force.[50]

In October 1789, according to a respected member of Rouen's legal community, artisanal mobilization stemmed almost exclusively from hatred of "the machines used in cotton-spinning that have deprived many workers of their jobs."[51] Yet machine-breaking was not solely the realm of those involved in the textile industries. Jean-Pierre Alline found that nearly 30 per cent of those arrested for machine-breaking worked in professions associated with textiles, but the single largest occupational grouping was agricultural day labourers at 15 per cent. There were also significant numbers of prostitutes and soldiers in the crowd. Such findings suggest that in 1789 rage against the machine was fundamentally an element of revolutionary agitation in Normandy.

Popular unrest petrified the authorities. Yet only the specter of a combination of attacks on the rich, on the authorities, and on industrial machines galvanized them to act. A large number of textile entrepreneurs with new cotton-spinning machinery to protect took the drastic step of distributing arms to their own hands. Thirty rioters were arrested for events on 14 July and six more were hanged for their participation in the outbreak on 3-4 August. Cannon were positioned by the public authorities to command the transit points into the city from its industrial suburbs.[52]

Thus, initially, the rapid spread of machine-breaking in Normandy contrasted strongly with the more gradual emergence of organized opposition to the machine in Great Britain. In Rouen, "in a single day, the misguided people have destroyed the benefit of nearly 100,000 *livres* of expense and more than fifteen months of

d'Amende envers le Roi, pour s'être introduit avec nombre de Séditieux armés de pioches et bâtons, dans la maison d'une particulier de la Paroisse de Sotteville, et d'voir commis nombre de violences et brisé plusieurs Méchaniques, 20 October 1789, Archives Départementales [hereafter AD] Seine Maritime 220 BP 14.

[49]Serge Chassange, *Le Coton et ses patrons: France, 1760-1840* (Paris 1991), 190; and Gay L. Gullickson, *Spinners and Weavers of Auffay: Rural Industry and the Sexual Division of Labor in a French Village, 1750-1850* (Cambridge, UK 1986), 89-90.

[50]Georges Ruhlmann, *Les corporations, les manufactures et le travail libre à Abbeville au XVIIIe siècle* (Paris 1948), ch. 7.

[51]Horcholle, *Evenements*.

work undertaken on their behalf." But the pattern of violence later followed by the Luddites materialized as more textile machines were destroyed in the suburbs of Rouen throughout the month of July and into August with flare-ups in September and October. When popular unrest ground to halt, more than 700 spinning jennies had been destroyed including nearly all the ones purchased in Great Britain or built on the English model in the previous few years. Among those who lost their property were several industrial pioneers who had been enticed from England to naturalize the use of advanced textile machines, such as George Garnett, whose workshop was sacked on 14 July. The wooden pieces of his broken machines were burned publicly and the metal parts scattered. The smoking debris of several years of government investment and entrepreneurial activity had a dramatic, though subtle, impact on the attitudes of economic decision-makers in Normandy.[53]

If northwestern France experienced repeated popular discontent that expressed itself partially through machine-breaking in July-October 1789, the pattern in the rest of France differed in important ways according to region and the industries involved, even more so than in Great Britain. As discussed above, in Saint-Étienne, a pattern of workers wrecking to avoid or forestall innovation preceded the emergence of a revolutionary moment. On 24 July 1789, a large group of miners and artisans in the metallurgical industries from Saint-Étienne marched on a nearby coal mine determined to prevent a company headed by the Marquis d'Osmond from opening a new large-scale pit that was to be run with steam engines and employ some German labourers. The crowd demanded that all foreign workers be exiled and work stopped. All the machinery was wrecked in the ensuing riot and then burned before the crowd returned to the city.[54]

In early September, machine-breaking recurred. Ken Alder's account clearly depicts how an innovator could be derailed by popular defence of customary production practices. Jacques Sauvade, a mechanic and entrepreneur from Ambert, sought to bring machines and processes for making metalwares to Saint-Étienne that he had seen in Germany. After six years of expensive trial and error, he set up a workshop to produce tableware, buckles, locks, and bolts that used stamping dies to cut through metal sheets produced by a water-powered rolling mill. He hoped to compete directly with the toy industry of Birmingham and the cutlery trade of Sheffield.

In a manner reminiscent of England, but not of Normandy, those directly affected by Sauvade's innovations took swift action. In the early evening on 1 September, a group of artisans specializing in the making of forks gathered outside the workshop. Several municipal officers appeared in an attempt to forestall popular violence. Sauvade recognized the threat to his investment of 5,000 *livres* and prom-

[52]Ballot, *L'Introduction du machinisme*, 20; Chassagne, *Le Coton*, 188-190; *Journal de Normandie ou Mémoires périodiques pour servir à Histoire Ecclésiastique, Civile, Naturelle & Littéraire, & à celle des Sciences, des beau Arts et du Commerce de Normandie* 58 (22 July 1789), 255-6; and Mollat, ed., *Histoire de Rouen*, 286-7.

ised the crowd that he would "delay perfecting his establishment until the people believed it offered some hope of employing workers, and if not, then desisting [from his innovations]." He even dismantled two cylinders essential to rolling sheet metal and handed them to the mayor for safekeeping. Appeased, the crowd dispersed. By the following morning, however, the crucial cylinders had disappeared, but that did not save Sauvade. A crowd dismantled the machines and waterworks, then burned the workshop. Perhaps by the design of the authorities, the troops sent to stop the destruction arrived too late to stop the pillaging. That evening some of the fork-makers threatened to beat up and burn the home of one of Sauvade's mechanics should he help to rebuild the hated machinery.[55]

The presence of a vast number of arms in Saint-Étienne led to renewed popular "borrowing" of weapons in November. On 10 November, arms workers accused the directors of the Arms Manufacture of sending weapons to émigrés who opposed the Revolution. When the workers' spokesman was arrested, a crowd materialized to demand his release. The commander of the militia was trampled in the ensuing clash. The following day, the Manufacture was despoiled and the entire stockpile of 5,612 muskets taken. The authorities fled the city. Upon their return, the weapons were recovered, but attitudes about the legitimacy of popular action in defence of custom had changed. The royal arms inspector, Augustin de l'Espinasse, reported that, "The journeymen of various fabriques had risen against their masters. As a result everyone had seen the need to disarm the people."[56] Armed, the "threat from below" could assume revolutionary proportions.

From the perspective of industrial development and technological modernization, the effects of this wave of machine-breaking were devastating for the region, France's preeminent metallurgical centre and only possible rival to Birmingham and Sheffield. The exploitation of the Rive-le-Gier coal basin remained crude, while the introduction of *métiers à la zurichoise* [Zurich-style ribbon-making machines] stalled until the Consulate. Sauvade's fate is most instructive. After two years of demanding recompense for his losses, he received only 1,500 *livres*. Sauvade claimed that parts of the commercial élite had sanctioned the destruction of his machines to defend their own position. He also asserted that the authorities

[53]The quotation comes from the *Rapport des Travaux de la Commission intermédiaire de Haute-Normandie*, 200. See also Reddy, *The Rise of Market Culture*, 59-60.

[54]Pétrus Faure, *Histoire du mouvement ouvrier dans le département de la Loire* (Saint-Étienne 1956), 54; and Galley, *L'Élection de Saint-Étienne*, 58.

[55]I generally follow the outlines of Alder's account and use his translation. *Engineering the Revolution*, 214-5. Additional details are from Galley, *L'Élection de Saint-Étienne*, 58, 74-5; and Paul Tézenas du Montcel, *L'Assemblée du département de Saint-Étienne et sa Commission intermédiaire (8 Octobre 1787 – 21 Juillet 1790)* (Paris 1903), 464; Denis Descreux, *Notices biographiques stéphanois* (Saint-Étienne 1868), 317-8; Jacques Schnetzler, "Les Industries et les hommes dans la région de St.-Étienne," PhD thesis, Université de Lyon II, 1973, 53; and Jacques Sauvade, *Mémoire*, (July 1789), Archives

refused to find and punish those responsible for the machine-breaking because it would upset the uneasy social truce then prevailing.

Yet Sauvade continued to tinker. He developed a variation of the zurichois ribbon-making machine that he patented in November 1791. But it soon became clear to him that the working classes would never allow its deployment. As a result, he relocated his fork-making operation to Mirecourt in the Vosges, where Alsatian metalworkers proved willing to accommodate mechanized production. This industry flourished well into the 19th century while it died out in and around Saint-Étienne despite the clear advantages and greater potential of the latter site.[57] The parallel to Hargreaves who, after his first workshop was wrecked, moved to an area noted for its machine-breaking propensities is stark. Industrial conditions and the unwillingness or inability of some local élites to discipline their labour forces impeded successful mechanization and retarded certain kinds of technological advance in the age of Revolution.

A final occurrence of machine-breaking in 1789 took place in southern Champagne. Subsistence was a particular problem in and around the city of Troyes, sparking a violent municipal revolution punctuated by a series of food riots that were accentuated by the Great Fear.[58] A deepening political conflict within the urban élite made it impossible for them to douse the flames spawned by fear and hunger among the restive unemployed textile workers and poor of the city of Troyes.[59]

These flames burst into a conflagration on 9 September with the public murder of mayor Claude Huez and the mutilation of his corpse. According to placards posted widely beforehand, along with subsistence-related concerns, the major charge against Huez was that, "he had favored machines." Huez was killed trying to defend the actions of local entrepreneurs, both flour merchants accused of hoarding grain and industrial innovators who had installed new cotton spinning machines. "Desperate men" began this riot demanding food; but when they attacked and burned the homes of officials and notables, they expressed their hatred of ma-

Communales de Saint-Étienne Ms 328 2 (2) [1 Mi 11]. These references apply too to the aftermath of the destruction of Sauvade's workshop discussed below.

[56]The description of events in November and the quotation are cited by Alder, *Engineering the Revolution*, 215-6. See also Thermeau, *À l'aube de la Révolution industrielle*, 19.

[57]Fork-making was only a small part of the metallurgical industries, smaller certainly than England's but still an important industry that produced for domestic consumption as well as for export. A key consideration here is that by dispersing innovation and exiling innovators to less critical sites, the possibility of creating a complex of innovation similar to that of Birmingham or of personally transferring technology became more remote. If the Lunar Society of Birmingham is taken as a context for British inventiveness, then this example of the clear disincentive to innovate in what eventually became the most important metallurgical centre in modern France cannot be dismissed lightly. See Jenny Uglow, *The Lunar Men* (New York 2002).

[58]See Lefebvre, *The Great Fear of 1789*; and Émile Chaudron, *La Grande peur en Champagne méridionale* (Paris 1923).

chines. Several of the shopfront homes of these élites had workshops in their basements. The targets were a number of prototype textile machines recently purchased from Paris and Rouen or imported directly from England. All were wrecked. Popular scapegoating of machines and the officials responsible for overseeing subsistence issues illustrates the many facets of "the threat from below" for élites during the summer of 1789.[60]

Although the number of machines destroyed in Troyes was scant, the effect of this incident loomed large for the city's industrial entrepreneurs. The day after the riot, the rulers of the city decided to ban mechanized spinning to prevent further unrest, even though this measure would throw at least 800 people out of work. In the months to come, plans by several leading textile firms to purchase Arkwright machines and to invest in other new technologies were dropped quietly. When petitioning the National Assembly for financial support to revitalize the economy of southern Champagne, a group of industrial entrepreneurs explained why they had not continued to invest in new machinery: "These machines are often attacked during popular riots because those involved in hand-spinning fear that large machines will diminish their salaries, a fear which is frequently sustained by ignorance...." Recognizing the militancy and intransigence of Troyes' labouring classes, industrial entrepreneurs there generally decided not to continue their purchases of advanced machinery. Instead, with the support of local authorities, they focused on maintaining total employment by shifting production to unmechanized sectors like linen, and meeting the needs of the regional market. Even the most optimistic of industrial entrepreneurs in Troyes decided to expand the hand-weaving of high-end cotton fabrics with thread made elsewhere rather than attempt to increase local spinning output. An emphasis on quality versus quantity was a major shift in approach for the Troyens; their changeover was not based on technological deficiencies or an inability to compete in the international marketplace, but on local political considerations. These entrepreneurs hoped their actions would not excite "any anxiety on the part of the indigent worker ... because we want nothing more ... than to ensure that they can earn their daily bread." To reinforce the lesson, hun-

[59]The standard account is Lynn Avery Hunt, *Revolution & Urban Politics in Provincial France: Troyes and Reims, 1786-1790* (Stanford, CA 1978). See also Jeff Horn, *« Qui parle pour la nation? » Les élections et les élus de la Champagne méridionale, 1765-1830* (Paris 2004), ch. 3.

[60] Albert Babeau, *Histoire de Troyes pendant la révolution*, 2 vols. (Paris 1873-74), I: 221, 232; *Jugement Prévôtal et en dernier ressort à Troyes*, 27 November 1789, BM Troyes, cabinet local 50; Bernard Maudhuit, "Recherches sur le textile troyen au XVIIIe siècle d'après le fond Berthelin et Fromageot," Maîtrise d'Histoire Économique, University of Reims, 2 vols., 1957, II: ch. 6; and Abbé Trémet, "Notes historiques de ce qui s'est passé à Troyes, 1770-1790," BM Troyes ms. 2-2322.

[61]The quotations in this paragraph are from the *Pétition des Négociants et Fabricans de Troyes au Comités d'Agriculture et Commerce et Finances*, 12 August 1791, Archives Nationales de France [hereafter AN], F12 1342. See also Babeau, *Histoire de Troyes*, I: 243;

dreds of female spinners in Troyes gathered to protest the introduction of jennies in 1791, successfully preventing their utilization.[61] Substantial investment in machinery in southern Champagne would not begin again until the Consulate, while the development of local inventive abilities would await the Restoration.[62] The contrast to the reaction of English cotton entrepreneurs, who would use this critical decade to forge even further ahead technologically, could not be more stark.[63]

Continued machine-breaking in other areas during the early years of the Revolution only served to spread the attitudes adopted by the entrepreneurs and officials of Troyes. Although the mid-October riot in Sotteville, Normandy, seems to have ended the incidence of direct action against machinery in 1789, sporadic flare-ups occurred over the next two years. The carders of Lille destroyed machines in 1790, and the following year, jennies were attacked in Roanne and outside the vital experimental workshop housed in the Hôpital des Quinze-Vingts in Paris. These events were severely repressed and the victims of machine-breaking indemnified according to the decree of 9 September 1791. Charles Ballot concluded, "One cannot say therefore that the hostility of workers was a serious obstacle to the introduction of machines in France." Frank Manuel agrees with this assessment, as do more recent assessments of the impact of French labour relations on technological choice.[64]

Ballot, *L'Introduction du machinisme*; Jacques-Edme Beugnot, "Discours," 3 November 1790; *Procès-verbal des séances du Conseil-général du département de l'Aube (1790)*, AN, F1CIII Aube 2; Jean Darbot, *La Trinité, première manufacture de bas au métier de Troyes* (Troyes 1979), 16; Maudhuit, "Recherches sur le textile troyen," II: 196-97, 38; François Pouchet, *Essai sur les avantages locaux du département de l'Aube, et sur la prospérité nationale, ou Adresse à Mes Concitoyens du Département de l'Aube*, 1791, AN, F12 652; and Jean Ricommard, *La Bonneterie à Troyes et dans le département de l'Aube: Origines, évolution. caratèreres actuels* (Paris 1934), 9-10.

[62]Darbot, *La Trinité*, 31-2; André Colomès, *Les Ouvriers du Textile dans la Champagne troyenne 1730-1852* (Paris 1943), 85-7; Jean-Nicolas Feugé, *Compte de la situation politique du département de l'Aube pendant le mois de nivôse an 8*, 15 Pluviôse, Year VIII (4 February 1800), AN F1CIII Aube 3; and Ricommard, *La Bonneterie*, 38-9.

[63]This situation and the heavy involvement of female labourers in machine-breaking foreshadows events on a significantly smaller scale in Pawtucket, Rhode Island. There a successful strike in 1824 threatened arson against machinery imported from Britain. See Kulik, "Pawtucket Village and the Strike of 1824," 4-37. The limitations on actual violence, however, points out the difference between events in the New World and a genuinely revolutionary situation. It also illustrates the temporal delay between the beginning of mechanized production around 1790 and the recourse to this form of violent protest nearly two generations later.

[64]Ballot, *L'Introduction du machinisme*, 21-2; Manuel, "The Luddite Movement," 180-3; Alain Belmont, *Des ateliers au village: les artisans ruraux en Dauphiné sous l'Ancien régime* (Grenoble 1998); Anne-Françoise Garçon, *Mine et métal 1780-1880: les non-ferreux et l'industrialisation* (Rennes 1998); Pierre-Claude Reynaud, *Histoires de papier: la papeterie auvergnate et ses historiens* (Clermont-Ferrand 2001); and Louis

Yet, the evidence from Troyes suggests the converse. Nor were the Troyens alone in fearing the consequences of labour militancy if they attempted to mechanize production. In 1792, officials in Amiens endorsed a suggestion made in Paris that they discontinue their pre-1789 use of "a portion of public funds to create workshops dependent on the use of new machinery" in favor of a strategy designed to permit a "progressive increase" in the number of workers who could be offered employment through a "limitation of the number of machines ... at work in the textile industry of the department of the Somme."[65] In the Year IV [1796], other departmental administrators complained of their inability to combat "the prejudice in public opinion against machines because they limit the amount of work available to the poor ... this prejudice against machinery has led the commercial classes ... to abandon their interest in the cotton industry."[66] According to departmental administrators and later the Somme's first prefect, fear of reprisals by the working classes — as in 1789 — appears to have amplified this shift in attitude by industrial entrepreneurs towards the machine.[67]

In the pivotal province of Normandy, the shift was both more immediate and more drastic. In the textile town of Yvetot, a municipal commission charged with investigating how to find work for the poor reported its findings on 30 December 1789. In order to avoid giving the unemployed a target, the Commission recommended that the municipality support a production shift from cotton to linen because it required no new machinery.[68] Early in 1790, the intermediate commission of the province reported that, despite widespread interest in acquiring new machinery as a means of bolstering international competitiveness on the part of both entrepreneurs and labourers before July 1789, they experienced grave difficulties "propagating the use of new machines." This problem remained in the face of "a gratuity proportionate to the talent of the worker." Furthermore, the industrial entrepreneurs' "abandonment of this type of work [on machines] has discouraged the administrators."[69] Some innovators feared that popular opposition would delay the introduction of new machinery until schools could be established that would educate the people about their "true interests."[70] Although sporadic attempts to import

Bergeron, "The Businessman," in Michel Vovelle, ed., *Enlightenment Portraits*, trans. Lydia G. Cochrane (Chicago 1997 [1992]),122-41; and, by the absence of machine-breaking, Jacques Marseille and Dominique Margairaz, eds., *1789, au jour le jour: avec en supplément, l'almanach gourmand, l'almanach mondain, le regard de l'étranger* (Paris 1988).

[65]Jacques-François Martin, *Circulaire*, 19 May 1792, AD Somme L496.

[66]*Mémoire sur les Encouragements à accorder au Commerce par le directoire du département de la Somme*, 22 Floréal, Year IV, [11 May 1796], AD Somme L496.

[67]*La Décade du département de la Somme* 24: 2 (30 Fructidor, An VIII [17 September 1800]); and Nicolas Quinette, *Lettre au Ministre de l'Intérieur*, 24 April 1806, AD Somme M80003.

[68]Poullain, *Analyses des délibérations*, 19-20.

new English machines into upper Normandy occurred in the 1790s, local opposition to mechanization retarded the technological development of the most advanced industrial region in France.[71]

Even in Paris, a centre of innovation and technological experimentation, the willingness of artisans and textile workers to defend traditional methods and to prevent mechanization could be quite powerful.[72] The labouring classes recognized the critical role of the state and were capable of persistent requests to the legislature, such as that of the ribbon-makers who sought to "prohibit the introduction, construction and usage in every department of machines to make ribbons...." Should the state fail to act, they threatened to break the machines that would render them technologically obsolete.[73]

With further research into entrepreneurial activities during the revolutionary era, additional examples of hostility to mechanization, resistance to innovation, and spirited defense of customary means of production from around the hexagon could be multiplied. The massive outbreak of machine-breaking in 1789 was part of the dramatic transformation of the "threat from below" from the realm of rebelliousness into something new: modern revolutionary politics. The French Revolution recast social relationships, gave birth to new ideologies, and provided a model for how a small dedicated group could mobilize a vast nation for war, overcoming civil conflict and economic collapse through the mechanism of state-wielded Terror. Ever since, the legacy of these innovations has both inspired and dismayed.[74]

The role of the popular classes in the French Revolution helps to explain the shift in entrepreneurial attitudes to such issues as mechanization, labour discipline, the role of the state, technological innovation, and profit-taking. Yet after 1791, machine-breaking was almost completely unknown in France until the Restoration (1814-30), in spite of the survival of organized groups of labourers, repeated and determined government efforts to create and adopt new technologies, and the boom and bust economic cycles of the revolutionary era. This hiatus can best be explained by the formulation of different, often more successful tactics by the labouring classes and the firm hand of the Napoleonic regime once mechanization in the cotton industry resumed during the Consulate. There was a minor surge of machine-breaking directed against the shearing machine with rotating blades in a few southern woolens centres in 1816-21. The sum total of damage was two broken ma-

[69]*Rapport des Travaux de la Commission intermédiaire de Haute-Normandie*, 166-7, 178.
[70]*Note pour servir de supplement au Mémoire de M. De Maurey sur les moyens de perfectionner les arts mécaniques*, slsd [1790], AD Seine-Maritime C 2120.
[71]André Dubuc, "L'Industrie textile en Haute-Normandie au cours de la Révolution et de l'Empire," in *Le Textile en Normandie: Études diverses* (Rouen 1975), 134-8.
[72]Haim Burstin, "Travail, entreprise et politique à la Manufacture des Gobelins pendant la période révolutionnaire," in Gayot and Hirsch, eds., *La Révolution française et le développement du capitalisme*, 369-79.

chines (albeit expensive ones at 20,000 francs apiece), no deaths, no judicial convictions, and the continued introduction of the shearing machine.[75]

Although contemporary to English Luddism, in its French incarnation, machine-breaking in the 19th century serves mostly to highlight the importance of what came earlier. Anglocentrism must not blind us to the importance of the wave of machine-breaking that took place in 1789-91. French machine-breaking was intertwined with growing popular militancy and the emergence of revolutionary politics, giving a decidedly different twist to labour relations in France that proved extraordinarily significant to the course of French industrial development. The "machinery question" investigated by Berg for the post-1815 period in Great Britain had, in large measure, been resolved a generation earlier in France.[76]

The importance of the gap of twenty-plus years separating the major incidences of machine-breaking in England and France cannot be underestimated. It is no coincidence that at the end of the Revolutionary and Napoleonic wars, England was widely recognized, both by contemporaries and by current commentators, to be about a generation ahead of France in technological terms, particularly in the creation of the factory system. The vast majority of French textile entrepreneurs postponed mechanization until the Consulate. At that time, they believed that the labour force was under sufficient control, but their efforts to innovate were derailed by transport problems, market fluctuations related to the creation of monopolies, lack of raw materials, shortages of skilled labour, smuggling, and, most significantly, the fortunes of war. The open-minded entrepreneurial drive that marked efforts to promote mechanization and technological innovation in the late 1780s could not be revived in the war-time, hot-house industrial environment of the continent under Napoleon.[77] England had no "capital-R" Revolution or revolutionary politics culminating in a state-sponsored Terror, and, as a result, the "threat from below" was never as sharp. As a result, England was able to build on its early advantages to forge a commanding lead in technology and productive practices in exactly this period. The precautions taken give the lie to any description of English industrial practice as "*laissez-faire*" so that entrepreneurs there could safely mechanize and institute innovative forms of industrial organization.[78] "Ned Ludd" did not have a guillotine at his disposal.

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[73]*Pétition à l'Assemblée National pour les Ouvriers-Rubaniers de la Ville de Paris,* 6 November 1791, AN, F12 1430.

[74]For those unfamiliar with this process, Doyle, *The Oxford History of the French Revolution* is a fine English-language introduction.

[75]See Manuel, "The Luddite Movement in France."

[76]Berg, *The Machinery Question.*

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